33618
S/035/62/000/002/007/038
A001/A101

3,1540 (also 1137)

AUTHORS: Krat, V. A., Krat, T. V.

TITLE: On physics of the solar chromosphere

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 1, 1962, 55,
              abstract 1A422 ("Izv. Gl. astron. obzerv. v Pulkove", 1961, v. 22,
              no. 2, 6-51, Engl. summary)

TEXT: This is a concluding article of the cycle of studies dealing with
the analysis and interpretation of the chromospheric spectrum. Fundamentals of
the method of profile analysis are presented. It is assumed that faculae in the
chromosphere consist of two quasi-homogeneous components. As a result of analysis
of spectra, conclusions have been drawn on the causes of hydrogen atom excitation,
and on possibility of existence of dark prominences. The problem was investi-
gated on the Lα emission field and on intensity of the D_3 line which is consider-
ably brighter over facula areas. Appearance of emission helium lines on the
solar disk is discussed. Data of the Pulkovo simultaneous observations of
chromospheric spicules in Hα and D_3 are presented. Apparently these lines are
produced in different places. Visible movements of spicules are explained by

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33618

On physics of the solar chromosphere

S/035/62/000/002/007/038
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propagation of condensation process of the coronal gas in the spicules. Calcium emission in the spicules is investigated. Spicules proper are considered to be weak chromospheric flares. There are 32 references.

E. Dubov

[Abstracter's note: Complete translation]

Card 2/2

SOV/35-59-10-8076

Translation from: Referativnyy zhurnal. Astronomiya i Geodeziya, 1959, Nr 10, p 63
(USSR)

AUTHOR: Krat, T.V.

TITLE: Chromospheric Condensations

PERIODICAL: Izv. Gl. astron. observ. v Pulkove, 1958, Vol 21, Nr 3, pp 11-18 (résumé
            Engl.)

ABSTRACT: With the aid of a two-camera spectrograph mounted on the horizontal solar
            telescope in Pulkovo, sections of the chromospheric spectrum with the $H\alpha$,
            D_1 and D_2 (Na) and D_3 (He) lines were photographed simultaneously. At
            eight points photometric cross-sections were made. Profiles were de-
            termined with allowances for the circumsolar corona. Taking the scatter-
            ing of light as the main reason for the glow, the author obtained reduced
            profiles of these lines. It is supposed that the glow in $H\alpha$ is partly due
            to incoherent scattering. In order to compare the "hydrogen" and "helium"
            chromospheres, the values of the equivalent $H\alpha$ and D_3 widths were plotted
            on a graph; the course of the equivalent widths for these lines was found
            to be different. On the basis of these results it was concluded that the

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Chromospheric Condensations   SOV/35-59-10-8076

concentrations of the hydrogen and helium filaments fluctuate sharply, and as a result of this, large-scale heterogeneities arise, and the fluctuations of the number of hydrogen filaments are considerably greater than those of helium. The values of the equivalent widths obtained for the lines D_1 and D_3 at three points are approximately equal to 1.5 and at one point to 2.25 (the theoretical ratio of the equivalent widths of these lines is equal to 2). The lesser value of the ratio shows the presence of self-absorption at the three measured points. The amount of self-absorption is estimated from the growth curve and ratio of the equivalent widths, D_1 and D_2, under observation. After the correction for the self-absorption and the re-calculation of intensities into absolute units, the number of Na atoms in the second quantum state is found, and hence the concentration of the Na atoms in the ground state. The number of Na atoms in the ground state was also found by a different method, i.e. by the amount of self-absorption. From the concentration of Na and from the known ratio of the Na content, it was derived that the number of H atoms in 1 cm^3 is $\sim 10^{15}$. Consequently in the Na emission region the concentration of hydrogen is heightened, that is, a general increase of density takes place. A high density and anomalously small value of Doppler widths of the Na lines ($\Delta\lambda \sim 0.06$ Å) indicate the presence in the chromosphere of comparatively cold ($T_c \sim 5,000°K$) gas condensations with a low turbulent velocity ($\xi_t \sim 2.3$ km/sec), similar in their properties to the photospheric formations. Bibl. 8 titles.

E.Ye. Dubov

Card 2/2

S/797/61/022/002/001/007
E032/E114

AUTHORS: Krat, V.A., and Krat, T.V.

TITLE: On the physics of the solar corona

SOURCE: Pulkovo. Astronomicheskaya observatoriya. Izvestiya.
               v.22, no.2 (167). 1961. 6-51.

TEXT: This is the concluding paper in a series reporting
theoretical and experimental work begun at the Pulkovo Observatory
in 1952. It is concerned with the analysis and interpretation of
chromospheric spectra on the basis of new ideas on the non-
uniformity of the chromosphere. An outline is given of the theory
of chromospheric line profiles, with particular reference to the
double-peak form of strong chromospheric lines. A new method for
the analysis of line profiles of chromospheric formations on the
solar disc and beyond the limb is outlined, and formulae are
derived for quasi-uniform two-component (macroscopically) models of
chromospheric faculae and flares. The methods have been applied to
spectrograms of chromospheric faculae observed beyond the solar
limb. The main causes of the excitation of hydrogen atoms are then
examined, with reference to new chromospheric observations with a

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On the physics of the solar corona   S/797/61/022/002/001/007
                                        E032/E114

large diffraction spectrograph built in 1957 (dispersion in the first and second order at H_α - 2.04 and 0.94 Å/mm; dispersion in the fifth order at 6300 Å - 0.161 Å/mm). There are two cameras, so that two spectral regions separated by 417 Å in the second order can be photographed at the same time. Analysis of the results obtained shows that the persistence of resonance in the Balmer lines may be explained by the low intensity of the radiation field at Lyman frequencies for the upper terms of the series beginning with L_β. The effects of electron impact and recombination are functionally related, so that there is practically only one mechanism for the intrinsic hydrogen emission. Ohman's "dark prominences" are thought to be formed when the electron temperature is low ($\leqslant 5000°$) while the hydrogen atom density at the second level is high. The inertia of the L_α radiation in chromospheric formations is very high. One of the most effective processes which can lead to a change in the L_α radiation field is photo-ionisation from all levels with subsequent recombination leading to the escape of a part of the radiation from the medium through absorption bands beyond the series limits. Emission in

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On the physics of the solar corona   S/797/61/022/002/001/007
E032/E114

Lyman continuum plays a dominant role in this process. The emission of facular regions in L_α should be due to a very thin gas layer above the faculae, and not the faculae themselves. The helium filaments in the chromosphere and absorption lines of helium on the solar disc are then considered. D_3 line profiles above facular regions are used to determine the absolute intensity of this line, which is found to be several times higher than the intensity above the undisturbed photosphere. This may be due to an increase in the electron temperature above the faculae. The logarithmic gradient β of the D_3 line intensity determined during total solar eclipses is in good agreement with the authors' data on the distribution of helium filaments above the photosphere and the density of neutral helium atoms in the filaments. Next, examples of a modification of the ionisation equilibrium due to rapid heating or cooling of the gas are considered. The ionisation equilibrium is apparently absent in helium filaments in the chromosphere. Formulae are derived for calculating the population of the 2^3S and 2^3P levels for sudden changes in the electron temperature. It is shown that helium line emission

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                                         E032/E114

by the solar disc may occur when the optical thickness of gas
condensations in the lines of the subordinate series is very large
and when the electron temperature reaches about 100 000°.   The
appearance of bright hydrogen flocculae on the solar disc is said
to be due to the virtually complete opacity of the reversing layer
in the Balmer lines (up to H_ϵ).   New observational data obtained
at Pulkovo for chromospheric spicules in H_α and D_3 are
reproduced.   The exceptionally large half widths of nine profiles
for spicules are thought to indicate the absence of spicules in
the chromosphere.   They are mainly formed at heights of 5000 to
10 000 km.   The line profiles for spicules are not gaussian and
exhibit extended wings.   The spicules observed in H and K light
are very weak and their line profiles are much narrower than those
of H_α and D_3.   There is no clear correlation between the
absolute intensities of H_α and D_3 for spicules.   Their line
profiles are also different, suggesting a different localisation
of hydrogen and helium emission in spicules.   Changes and
displacements of spicules are largely due to the condensation of
coronal gas, and not to the motion of spicules.   Spicules are

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On the physics of the solar corona   S/797/61/022/002/001/007
E032/E114

regarded as weak chromospheric flares, and it is suggested that
phenomena similar to those occurring during the formation of
spicules should also take place in prominences.
There are 13 figures and 5 tables.

SUBMITTED: March 1960

Card 5/5

SOURCE CODE: UR/3019/05/000/004/0015/0020

ACC NR: AT6023358

AUTHOR: Krat, T. V.

ORG: none

TITLE: The helium D$_3$ line in the penumbra of a large spot

SOURCE: Shemakha. Astrofizicheskaya observatoriya. Soobshcheniya, no. 4, 1965. Fizika Solntsa (Physics of the sun), 15-20

TOPIC TAGS: absorption spectrum, helium, sunspot

ABSTRACT: Spectroscopic observation of the helium D$_3$ line on the solar disc is described. This line was observed on 8 May 1960 in the absorption spectrum. This line appears in conjunction with a solar flare and is shown to be dissociated from occurrences in the chromosphere. The author describes the instrumentation used for the detection of the line and shows the results of the photometric analysis of the resulting spectrum. It was possible to show that the origin of the absorption line, relating to a particular location on the solar spot producing the absorption, determines the spectral shape of the line. This in turn was used to determine the local temperature and velocity of the spot. The intensity of the line was used to derive, within an order of magnitude, the number of electrons per unit volume (about 10^{10} cm^{-3}). These values are expected to be somewhat modified in the presence of possible turbulence in
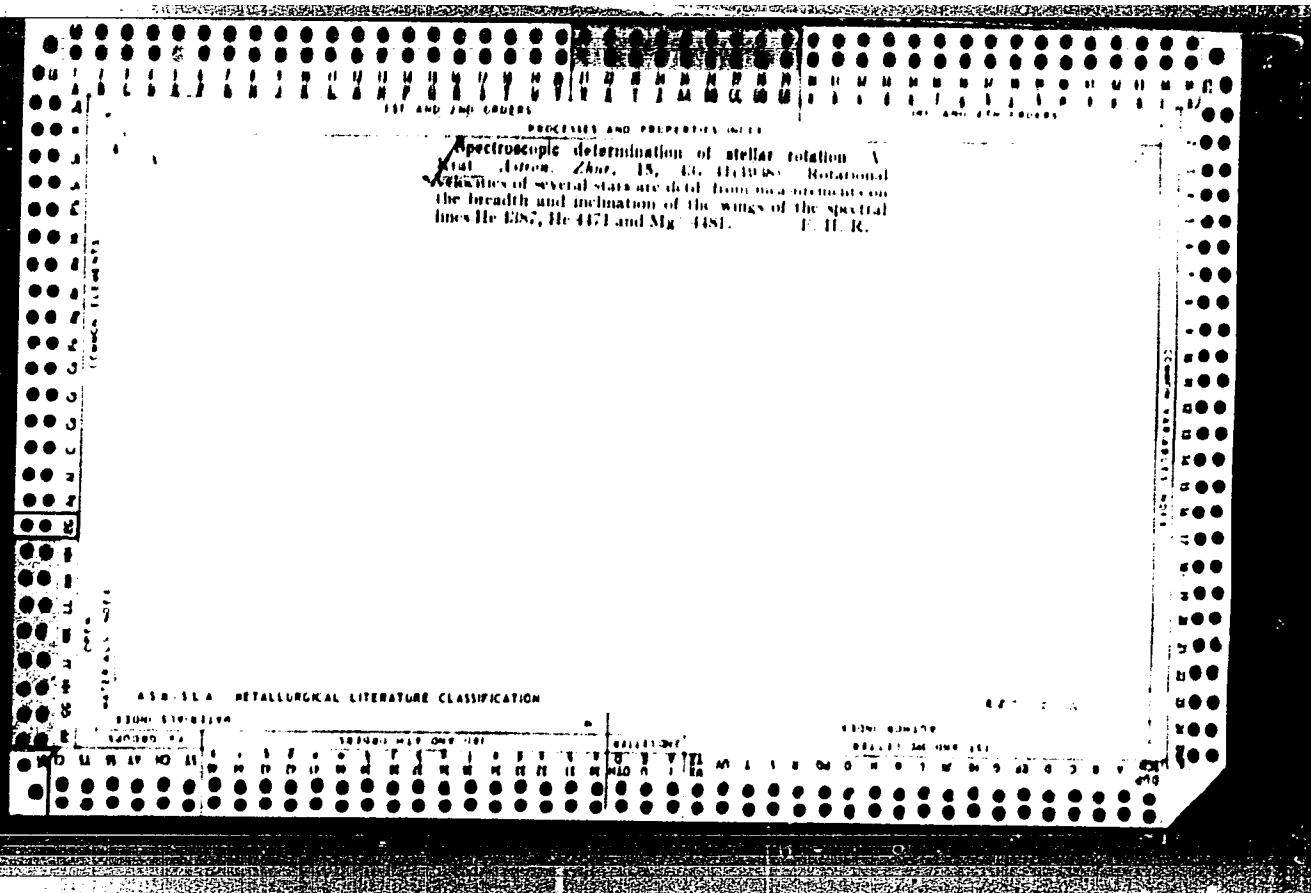
Card   1/2

ACC NR: AT3023633

helium streams, giving an upper temperature limit of about 20,000°K. Orig. art. has:
2 tables, 2 figures.

SUB CODE: 03,20/ SUBM DATE: 00/ ORIG REF: 004/ OTH REF: 000

Card 2/2

IST AND 2ND ORDERS

PROCESSES AND PROPERTIES INDEX

Spectroscopic determination of stellar rotation. A.
tal. Astron. Zhur. 18, 40 (1941). Rotational
velocities of several stars are deduced from measurements on
the breadth and inclination of the wings of the spectral
lines He 4387, He 4471 and Mg 4481.   F. H. R.

A S A - S L A   METALLURGICAL LITERATURE CLASSIFICATION

KRAT, V.

"Ellipticity of close binaries," Astron. Zhur., 17, No 3, 1940. (submitted Feb 1940, Pulkovo)

Report U-1518, 23 Oct 1951

KhAI, Prof. V. A.

"On Cyclical Explosions of Novae," Dok. AN, 27, No. 9, 1940.

KHAT, V.

"Some problems on the theory of light scattering in the earth's atmosphere," Astron. Zhur., 1, No 6, 1942. (submitted 23 Jan 1942, Alma-Ata)

Report U-1518, 23 Oct 1951

KRAT, V.

Nekotoryye zadachi teorii rasseyaniya sveta v zemnoy atmosfere (Some Problems of the
Theory of Scattering of Light in the Earth's Atmosphere). Astronomicheskiy zhurnal,
1942, v. 19, no. 6, p. 18-29, diagrs. Summary in English.

QB1.A47   v. 19

KRAT, V. A.

"Indicatrix of Light Scattering in the Earth's Atmosphere."
Astronomicheskiy zhurnal, 1943, v. 20, no. 5/6, p 23-33. Summary in English.

KRAT, V.

Krat, W. Solar hydrodynamics. I. Bull. Observ. Poul-kovo 17, no. 1(136), 58–88 (1947). (Russian. English summary)

The essential mathematical portions of the paper deal with the problem of the rotation of a polytropic gas sphere in which the angular velocity ω has the form

$$\omega^2 = c_1^2 \omega_0^2 + \sum_i c_i \omega_i^2 P_i(\mu),$$

where the c_i's are numerical coefficients and $P_i(\mu)$ is the Legendre polynomial of order i. From the discussion of this case the author concludes that "all barotropic configurations are initially instable for any displacements of baro-tropic or baroclinic nature." The paper also summarizes at some length the relevant literature on the subject.

S. Chandrasekhar (Williams Bay, Wis.).

Krat, V., and Petrov, S. **Tables of the auxiliary functions ψ and χ for determining the elements of systems of eclipsing variables.** II. Izvestiya Astr. Observ. Pulkovo 17, no. 5(140), 117–120 (1947). (Russian)

The first two tables in the paper under review contain 3D values of Russell's function $\psi(k, n)$ which is basic to his method for determining the elements of eclipsing binary systems from an analysis of their light curves due to total or annular eclipses of completely darkened stars; the range of arguments is $k = 0.1(0.1)1.0$ and $n = 0.0(0.1)1.0$ in table 1 (total eclipses); and $k = 0.2(0.1)1.0$, $n = 0.0(0.1)1.0$ for table 2 (annular eclipses). The interval of tabulation in either argument is too large to make the tables easy of interpolation. Both these tables appear to be improved versions of old tables of the same functions published by Russell and Shapley [Astrophys. J. 36, 239–254 (1912); table IIx; 385–408 (1912), table IIy]. The discrepancies between the old and new tables are very large (affecting frequently the second significant figure) and due probably to the inferior quality of Russell and Shapley's ψ-tables [tables Ix and Iy of their papers just referred to] which are at the basis of the ψ's: Krat and Petrov had presumably at their disposal the new accurate tables of the ψ-function constructed by Zessewitsch [Bull. Inst. Astr. Acad. Sci. URSS, no. 45 (1939); cf. Math. Tables and Other Aids to Computation 3, 191–195 (1948)].

The original part of the paper under review consists of its extensive table 3, containing 4D values of Krat's auxiliary functions ψ and χ for $\lambda = 0.1(0.1)1.0$ and $\alpha = 0.0(0.1)0.9$ [for their definition cf. Krat, Russian Astr. J. 11, 405–414 (1934); 12, 21–27 (1935)], computed on the assumption that the star undergoing eclipse appear as a uniformly bright disk.

Z. Kopal (Cambridge, Mass.)

$A52$

523.7   2380

On the positive charge of the sun. KRAT, V. C.R. Acad. Sci. URSS, 56 (No. 3) 203-6 (1947).—To prevent an escape of excess electrons from the corona, the sun's electric field must nearly wipe out the weight of coronal ions. An isolated prominence must similarly acquire an electric field which may dissipate the ions in a few hours.   T. O. C.

KRAT, V.

USSR/Physics   Deo 1947
    Solar Radiation
    Radiation, Corpuscular

"Corpuscular Radiation of the Sun," V. Krat,
Pulkovskiy Observatory, 4 pp

"Dok Akad Nauk SSSR, Nova Ser" Vol LVIII, No 7

Reports study of the mechanism of corpuscular radia-
tions connected with electrical pole of Sun and
poles of radiation pressure. Submitted by Academi-
cian G. A. Shayn, 7 Feb 1947.

60T108

KRAT, V. A.

PA 78T73

USSR/Physics
       Corona, Solar   Apr 1948
       Solar Phenomena

"Two Solar Coronas," Prof V. A. Krat, 1 p

"Priroda" No 4

There are two solar coronas, not one, as previously
thought. First discovered by the Soviet astronomer
G. A. Tikhov, who described them as "spherical" and
"radiant."

78T73

KRAT, V.

Role of Radiation in Stellar Evolution

Astron. Zh. Acad. Nauk, USSR
Vol. 25, No. 6, pp. 455-459

From: U. S. S. Astrin in Radioastrophys. Res. IAS. No. 2, Vol. 3, May 1948, p. 4

KRAT, V.

PA 8/49T107

USSR/Physics   Jul 48
    Solar Phenomena
    Corona, Solar

"Electrical Charges in Solar Corona," V. Krat,
Pulkovo Observatory, 4 pp

"Dok Akad Nauk SSSR" Vol LXI, No 1

Krat attempts to evaluate possible effect of the
electrical conductivity of interstellar gas on the
stationary charge of the sun, putting forward no
special hypotheses for the causes of hydrogen ioni-
zation or the disposition of ions and electrons in
interstellar space. Submitted 6 Apr 1948.

8/49T107

KRAT, Prof. V. A.

"Contemporary Cosmogony and Astrophysics," Priroda, No. 5, 1949.

KRAT, V. A. Prof

PA 67/49T7

USSR/Astronomy - Spectra
Stellar Phenomena   Aug 49

"Spectra of Carbon Stars," Prof V. A. Krat, 3/4 p

"Priroda" No 8

Briefly analyzes the difference between carbon (N) and oxygen (M) stars, and reviews two articles of Shayn and V. F. Gaze in the "News of the Crimean Astrophysical Observatory." On the basis of measurements of the wave lengths of isolated lines, authors described the spectra of molecular bands of N-stars. They discovered 72 unknown bands,

USSR/Astronomy - Spectra   (Contd)   Aug 49

some of which belonged to the $C^{13}N^{14}$ heavy molecule. They studied the atomic lines of hydrogen and neutral metals (Fe, Cr, Mn, Tl, etc.) common to N- and M-star spectra. They noted the intensities of the lines in M-stars, metallic elements and the Swan band C_2 formed by molecules $C^{12}C^{12}$, and $C^{13}C^{12}$, $C^{13}C^{13}$.

67/49T7

KRAT, V.

Krat, V. - "The theory of the solar atmosphere", (Part 2), Izvestiya Glav. astron. observatorii v Pulkove, Vol. XVIII, 1, No. 142, 1949, p. 1-29, - Bibliog: 19 items, (Part 1: Vol. XVIII, 3, No. 139, 1947).

SO: U-411, 17 July 53, (Letopis 'Zhurnal 'nykh Statey, No. 20, 1949).

KRAT, V.

Krat, V. - "The spectrum of the solar corona of 9 July 1945", Izvestiya Glav. astron. observatorii v Pulkove, Vol. XVIII, 1, No. 142, 1949, p. 30-38, - Bibliog: 13 items.

SO: U-411, 17 July 53, (Letopis 'Zhurnal 'nykh Statey, No. 20, 1949).

S A   A 55

551.510.535 : 523.4

6187.   On the positive charge of planetary atmospheres. V. A. Krat. *Astr. J., USSR*, 26 (No. 4) 201 (1949) *In Russian.* English Abstr. in *Astr. News Letter* [*Harvard*] (No. 47).

An analogy is drawn between the solar corona and the F2 layer of the ionosphere, and the equilibrium conditions of the latter studied in detail. If the earth is surrounded by a vacuum, the equation of equilibrium leads to the fraction of the force of gravity compensated by electrostatic repulsion upon the O$^+$ ion $\beta = 0.52$. The positive electric charge of the earth (mass m_E) Z is calculated from the relation $eZ = gm_E m^+ \beta$; $Z = 2.2 \times 10^7$ e.s.u.   The time required to establish this equilibrium $\simeq 10^6$ sec. If interplanetary space contains an ionised gas at very low pressure, $Z = 2 \times 10^7$ e.s.u. The modification introduced by the magnetic field of the earth is considered, the positive charge being concentrated in polar regions.   It is suggested that the high temperature of the F2 region, the cause of which is discussed, may account for the absence of free H and He in the atmospheres of the earth and Venus.

M. W. OVENDEN

Atmospheric Electricity

METALLURGICAL LITERATURE CLASSIFICATION

SA   A 52

523.12 : 523.8 : 521.03/.04

2283.   *Corpuscular instability of stars.* KAUT, V.
DokL. Akad. Nauk, SSSR, 99 (No. 5) 875-8 (1949)
In Russian.—From the equation of the stationary
state of a star, previously given by the author [*ibid.*,
55 (No. 3) (1947)], it is possible to estimate the con-
tinuous loss in fast electrons and protons. The
assumed case when the protons are not affected by
gravity is investigated. This produces what the
author terms *corpuscular instability* of the star,
i.e. continuous loss of matter. Theory gives a very
simple relation for the limiting radius of instability,
viz. $m/TR = 7.0 \times 10^{11}$. It can easily be shown that
for given m, R, and T, corpuscular instability, as a
special case of the stationary state, may occur in-
stantly. As an example, the calculation is carried
through for the sun, and the upper limit of its relaxa-
tion time is found as 10^{9} years. On certain assump-
tions on the constants of the equation, however, a
stationary state of the star could never materialize,
but the positive charge would rise indefinitely and the
relaxation time accordingly be reduced by several
orders of magnitude. The conclusion to be drawn
is that whenever the radius of instability is surpassed

by a star, this star must disintegrate within a cosmo-
logically short period ($<10^{9}$ yr). Thus an upper
limit for a star's radius is established. The value
found is $R = 3.16$ astr. units (for $T = 6000°$ and
$m =$ mass of sun). Interesting comparisons between
earlier stages of the sun's development and the
observed conditions of the Cepheid stars are drawn,
from which it appears that the latter are in a near-
critical state. A consequence of this is the observable
fact that the stars of this class are progressively
depleted of H, if at a very slow rate. A further series
of conclusions is arrived at regarding the critical
radii and possible maximum temps. of small celestial
bodies (e.g. of the size of earth and moon).   B. F. K.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

КRАТ, V. А.

PHASE X   TREASURE ISLAND BIBLIOGRAPHICAL REPORT   AID 688 - X

BOOK   Call No.:   QB351.K7
·Author: KRAT, V. A.
   Full Title: EQUILIBRIUM FIGURES OF CELESTIAL BODIES
   Transliterated Title: Figury ravnovesiya nebesnykh tel
PUBLISHING DATA
   Originating Agency: None
   Publishing House: State Publishing House of Technical and
                        Theoretical Literature
   Date: 1950   No. pp.: 339   No. of copies: 2,000
   Editorial Staff: None
PURPOSE AND EVALUATION: The book is intended for readers familiar with
     the elementary theory of the potential, the fundamentals of classical
     hydrodynamics and the general university course in astronomy. It may
     also serve as a textbook for students of the last semesters of the
     physical and mathematical faculty. V. A. Krat's work is a valuable
     contribution to astronomic literature. There is no book of the kind
     in English scientific literature. Discussion of the problem of equili-
     brium of compressible fluid may be found in articles scattered through-
     out periodical publications, but monographic works deal with incom-
     pressible fluid only. The merit of the author is bringing together in
     one volume all the theoretical conclusions on the problems of equili-

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Figury ravnovesiya nebesnykh tel   AID 688 - X

brium of compressible fluid obtained up to the present time and in
describing the contemporary state of the theory. Otto Struve of
Harvard calls this book an original work rich in ideas.
TEXT DATA
   Coverage: This book is devoted to the theory of equilibrium figures
      of celestial bodies. Along with theoretical conclusions the author
      discusses the results of observations of compressions and tidal de-
      formations of celestial bodies. The book is divided into nine
      sections. Section I deals with fundamentals of modern astronomy on
      figures of stars and planets and methods of their study (special at-
      tention is given to close binaries); section II, with the theory of
      the potential as far as necessary for subsequent conclusions;
      section III, with fundamental data of the theory of the inner
      structure of indisturbed stars; section IV, with brief discussion
      of the problem of various types of rotation of compressible masses
      and the threshold value of the rotation of stars; section V, with
      the review of the classical theory of the figures of the uniform
      incompressible fluid and also of the Roche model; section VI, with
      the most important results of the modern theory of small deformations
      of rotating gaseous masses; section VII, the classical problem of a
      binary (Roche, Darwin), the modern theory of compressible configura-

2/4

Figury ravnovesiya nebesnykh tel

No. of References: Total 53, 1923-1948, 28 Russian.
Facilities: None

4/4

tions, and the question of the relation between the form of the equilibrium figure and the inner structure of a star; section VIII, with the problems of stability of celestial bodies; section IX, with a series of cosmogonic problems related to the theory of configuration of the equilibrium of celestial bodies. The appendices deal with elements of binaries.

3/4

1. IRAT, V.

2. USSR (600)

4. Spectrum, Solar

7. Spectrum of the chromosphere and faint protuberances.
   Izv. Glav. astron. obs, 18. no. 6. 1951.

9. **Monthly List of Russian Accessions**, Library of Congress, February 1953. Unclassified.

KRAT, V.A.

Origin of the solar system. Vop.kosm.1:34-91 '52.   (MLRA 7:2)
(Solar system)

1. KRAT, V. A.

2. USSR   (600)

4. Plaut, L.

7. Elements of the Ecliosing Binaries brighter than photographic magnitude 8.50
   at maximum. L. Plaut. Reviewed by V. A. Krat. Per. zvezdy 3, No. 6, 1952.

9. **Monthly List of Russian Accessions**, Library of Congress, ____May____ 1953. Unclassified.

KRAT, V. A.

234T70

USSR/Astronomy - Stars, Formation of   21 Oct 52

"Star-Formation Process," V. A. Krat, Main Astr Obs, Acad Sci USSR

"Dok Ak Nauk SSSR" Vol 86, No 6, pp 1081-1084

Formation of stars represents the process of compression of an originally cold nebula or cloud of prestellar bodies; the chem compn of this nebula will essentially differ depending on whether the nebula is purely gaseous or gas-dust. Considers conditions for the creation of hydrogen from heavier elements (i. e., gravitational compression, heat, etc.).

Concludes that the original nebulae must contain hydrogen in their nuclei, and that hydrogen is practically absent in the centers of stars at their nonequilibrial stage of development. Submitted by acad O. Yu. Shmidt 21 Aug 52.

Krat, V. A. and Krat, T. V.: O konturakh spektral'nykh linij solnechnoj khromosfery [Spectral-line profiles of the solar chromosphere]. Pulkovo. Glavnaia Astronomicheskaia Observatoriia, Izvestiia, 19 (6):1–34, 1955. 16 figs., 15 refs., 17 eqs. Trans. into English by Bronislaw de L. Jesleraki and David Kraus. Issued by American Meteorological Society under Contract AF 19(604)-1936, Feb. 1957. 55 p.

3

4

1. KRAT, V. A.

2. USSR (600)

4. Astrophysics

7. Bulletin of the Crimean Astrophysical Observatory. vol. 9. Reviewed by V. A. Krat.
   Astron. zhur. 30, No. 2, 1953.

9. Monthly List of Russian Accessions, Library of Congress, ____April____ 1953. Unclassified.

KEAT, V.

Sun – Granules

Certain peculiarities of solar granulation. Dokl. AN SSSR 79, No. 4, 1953.

Observations of solar granules were made in Pulkovo on horizontal solar telescope, system of N. G. ponomarev with Maksutov mirrors. Assumes that appearance of granules reflect a wavelike transfer of energy from deep layers to the surface. Presented by Acad G. A. Shayn 6 Feb 53

256T87

KRAT, V. A.

USSR/Astronomy - Solar Corona   1 Aug 53

"Inhomogeneity of the Solar Corona," V. A. Krat,
Main Astron Obs (GAO), Acad Sci USSR

DAN SSSR, Vol 91, No 4, pp 757-758

Continues analysis of spectrum of "anomalous
solar prominence (cf. Izv GAO, No 147 (1951)),"
estimates widths of lines H and Ca in spectrum of
corona and presents them in a table. Presented
by Acad G. A. Shayn 8 Jun 53.

272T32

The Committee on Stalin Prizes (of the Council of Ministers USSR) in the fields of science and inventions announces that the following scientific works, popular scientific books, and textbooks have been submitted for competition for Stalin Prizes for the years 1952 and 1953. (Sovetskaya Kultura, Moscow, No. 22-40, 20 Feb - 3 Apr 1954)

Name	Title of Work	Nominated by
krat, V. A. Vyssanitsyn, V. . .	Works on he study of the sun	Main Astronomical Observatory, Academy of Sciences USSR

SO: W-30604, 7 July 1954

KRAT, V.A.

Study of the granulation of the solar photosphere. No. 1.
Izv.Glav.astron.obser. 19 no.5:1-8 '54.   (MIRA 8:7)
    (Sun--Granule)

KRAT, V.A.; PROKOF'YEVA, I.A.

Structure of the solar chromosphere. Izv.Glav.astron.obser. 19
no.5:9-19 '54   (MIRA 8:7)
    (Sun)

KRAT, V.A.

Structure of the solar chromosphere. Izv.Glav.astron.obser. 19
no.5:20-30 '54.   (MLRA 8:7)
    (Spectrum, Solar)

KRAT, V.

The mass of the sun in the era of planet formation. Dokl.AN SSSR
95 no.3:481-484 Mr '54.   (MLRA 7:3)

Predstavleno akademikom V.G.Fesenkovym.
                                (Nebular hypothesis) (Solar system)

USSR/ Astronomy

Card   : 1/1

Authors   : Krat, V. A.

Title   : On the contour of the chromospheric line H_α.

Periodical   : Dokl. AN SSSR., 97, Ed. 1, 45 - 47, July 1954

Abstract   : The hydrogen chromorpheric line H_α was examined in the solar spectrum, by means of a large diffraction spectrograph installed in the Pulkovo Observatory, near Leningrad. The instrument and the spectrograms are described in detail. It was concluded that the contour H_α could not be treated as a "Doppler contour". A new concept is therefore proposed as a basis for the observation of the solar atmosphere. Two references; one of these is a USSR reference of 1954. Diagrams; illustration.

Institution : Main Astronomical Observatory of the Academy of Sciences of USSR

Presented by : Academician, G. A. Shayn, April 1954

KRAT, V.A.

Gradients of chromosphere lines (derived from observations of the total solar eclipse of February 25, 1952). Izv.GAO 19 no.6:31-39 '55.
(MIRA 13:5)
(Spectrum, Solar)   (Eclipses, Solar--1952)

KRAT,V.A.; KRAT,T.V.

   Contours of spectrum lines of the solar chromosphere. Izv.
   GAO 19 no.6:1-30 '55.   (MIRA 13:5)
           (Spectrum, Solar)

KRAT, V. A.

USSR/Astronomy - Solar corona

Card 1/1 Pub. 8 - 11/13

Authors   : Krat, V. A.

Title   : Regarding the questions on the dissipation of the solar corona

Periodical : Astron. zhur. 32/1, 90-92, Jan-Feb 1955

Abstract   : Comments on the paper by G. M. Nikol'skiy and Ye. A. Ponomarev are
presented. It was shown that the paper was based on a series of
erroneous assumptions and, therefore, could not give the correct
answer to the question on the dissipation of the solar corona. Nine
references: 1 Norwegian, 1 USA, 6 USSR and 1 German (1921-1954).

Institution : Acad. of Scs. of the USSR, The Main Astronomical Observatory

Submitted   : May 28, 1954

KRAT, V.A.

Origin of the solar system. Izv.GAO 20 no.3:1-15 '56.
(MIRA 13:5)

(Solar system)

KRAT, V.A.; KRAT, T.V.; PRAVDYUK, L.M.

Physical nonhomogeneity of the solar chromosphere. Izv.
GAO 20 no.3:60-66 '56.   (MIRA 13:5)
                (Sun)

KRAT, V.A.

The use of photography in studying the sun. Zhur. nauch. i
prikl. fot. i kin. 1 no.4:302-309 Jl-Ag '56.   (MLRA 9:10)

(Astronomical photography)

KRAT, V.A.

Gas circulation around close double stars [with summary in German].
Per. zvezdy 11 no.5:359-368 Jl '56.   (MIRA 12:1)

1.Glavnaya astronomicheskaya observatoriya AN SSSR Pulkovo.
                    (Stars, Double)

KRAT, V.A.; SOBOLEV, V.M.

Excitation of helium in the solar chromosphere. Dokl.AN Azerb.SSR 12
no.9:617-621 '56.   (MLRA 9:10)

1.Predstavleno akademikom Akademii nauk Azerbaydzhanskoy SSR Z.I.Khalilovym.
    (Helium) (Sun—Prominences)

KRAT, V.A.; GOL'DBERG-ROGOZINSKAYA, N.M.

Investigating granulations of the sun's photosphere. Part 2.
Izv.GAO 20 no.2:17-21 '56.   (MIRA 13:5)
              (Sun)

KRAT, V.A.; KRAT, T.V.

Structure of the solar chromosphere and contours of chromosphere spectrum lines. Izv.GAO 20 no.2:1-16 '56.   (MIRA 13:5)
(Sun)

KRAT, V.A.

    Physical nonhomogeneity of the solar atmosphere. Izv.Krym.
astrofiz.obser. 16:200-206 '56.   (MIRA 13:4)

    1. Glavnaya astronomicheskaya observatoriya AN SSSR.
              (Sun)

KRAT, V.

The heterogeneity of the solar chromosphere and the problem of helium excitation. Dokl.AN SSSR 106 no.4:619-622 F '56.   (MLRA 9:6)

1.Glavnaya astronomicheskaya observatoriya Akademii nauk SSSR v Pulkove. Predstavleno akademikom G.A.Shaynom.
          (Spectrum, Solar) (Helium)

KRAT, V.A.; SOBOLEV, V.M.

The solar chromosphere.   Izv.GAO 21 no.1:116-139   '57.
(MIRA 13:4)

(Sun)

KHAT, V.A.

Origin of the solar system [with summary in English]. Vop. kosm.
5:47-55 '57.   (MLRA 10:8)
          (Solar system)   (Cosmogony)

KRAT, V.

Very hot areas on the sun. p.29.
Aurora borealis and the light of the night sky in the International Geophysical
Year 1957-59. p.30.
(Casopis Ceskoslovenskych Ustavnu Astronomichkych, Vol. 7, No. 3, 1957, Praha,
Czechoslovakia)

SO: Monthly List of East European Accessions (EEAL) LC. Vol. 6, No. 9, Sept. 1957. Uncl.

К Р Д Т V. Н.

AUTHOR: Krat, V. A.   33-5-10/12

TITLE: Solar Observations During the International Geophysical
        Year. (O Nablyudeniyakh Solntsa vo Vremya Mezhdunarodnogo
        Geofizicheskogo Goda.)

PERIODICAL: Astronomicheskiy Zhurnal, 1957, Vol.34, No.5,
        pp. 790-793 (USSR).

ABSTRACT: The main aim of the comprehensive studies of the sun
        during the International Geophysical Year is to discover
        the effect of solar activity on processes which take place
        in the magnetic field and the atmosphere of the Earth.
        This requires an intensive, systematic, and day to day
        observations of various phenomena on the surface of the
        Sun. In the Soviet Union the chromospheric-photospheric
        telescope will be used for this purpose. This instrument
        includes a photoheliograph designed to photograph
        photosperic formations and a reflector with an interference
        polarising filter (IPF) which can be used to observe the
        Sun on a wavelength corresponding to the central part of
        the II_α line. Chromospheric photospheric telescopes have
        been set up and are working in the following stations:
        Crimean Astrophysical Observatory, Mountain Station,
Card 1/3 Main Astronomical Observatory, Azerbaydzhan Observatory,

33-5-10/12

Solar Observations During the International Geophysical Year.

Tashkent Observatory, Alma-Ata Observatory and its high altitude station, the Far Eastern Station, Institute of Geomagnetism, Ionosphere, and Radiowave Propagation (near Moscow), and the Main Astronomical Observatory of the Academy of Sciences of the Ukraine. In the near future similar telescopes will be working in the following: Lvov University, Irkutsk Station and the Observatory of the Kiyev University. One telescope will be sent to Chinese People's Republic. Observations will also be continued with instruments already in use, namely, the spectrohelioscopes and spectroheliographs. Spectro-helioscopes are working at the Crimean Astrophysical Observatory, Abastumani Observatory, the Tashkent Observa-tory, and the Observatory of the Kiyev University. A similar instrument is being used in Chechoslovakia. The solar disc is being photographed using the central part of the K line of ionised calcium at the Crimean Observatory, the Mountain Station of the Main Astronomi-cal Observatory, the Observatory of the Khar'kov University, and lately at the Observatory of the Moscow University on Lenin Hills. At the same time systematic observations of solar radio emission are being carried out in the region

Card 2/3 0.5 to 1.5m. This is being done at the Crimean

33-5-10/12

Solar Observations During the International Geophysical Year.

Astrophysical Observatory, the Mountain Station of the Main Astronomical Observatory, and the Radiophysical Institute of the Gor'kiy University. At Pulkovo ·observations are being carried out in the centimeter range (3 cm.). Observations of the Corona are being made with Liot coronographs at two Mountain Stations, one near Kislovodsk and one at Alma-Ata. Full information of all this work will be given in "Catalogues of Solar Activity" and "Solar Data" issued on behalf of the Commission for Solar Studies.

SUBMITTED: July, 29, 1957.

ASSOCIATION: Main Astronomical Observatory of the Academy of Sciences of the USSR. (Glavnaya Astronomicheskaya Observatoriya Akademii Nauk SSSR.)

AVAILABLE: Library of Congress.

Card 3/3

KRAT, V. A.

KRAT, V.A., professor (Pulkovo).

Plenum of the Commision on Solar Research. Priroda 46 no.5:110-
111 My '57.   (MIRA 10:6)

(Sun)

KRAT, V.; SOBOLEV, V. M.;

"Hydrogen and Helium Excitation in the Chromosphere and Chromospheric Flares,"

Paper presented at the XIth General Assembly of the IAU, Moscow, 12 1958.

KRAT, V. A.,

On the Process of Formation of Terrestrial Planets,"

paper presented to the 12th General Assembly of the IAU, Moscow,   Aug 1958.

КАН, V·П

3(1)   PHASE I BOOK EXPLOITATION   SOV/1391

Akademiya nauk SSSR. Astronomicheskiy sovet.

Polnyye solnechnyye zatmeniya 25 fevralya 1952 i 30 iyunya 1954 g.
    Trudy ekspeditsiy po nablyudeniyu zatmeniy (Total Eclipse of the
    Sun, February 25, 1952 and June 30, 1954. Trensactions of the
    Expedition to Observe Solar Eclipses) Moscow, Izd-vo AN SSSR, 1958.
    357 p. 1,200 copies printed.

Editorial Board: Pariyskiy, N.N., Candidate of Physical and Mathema-
    tical Sciences (Resp. Ed.); Kononovich, E.V. (Secretary); Kuz'min,
    A.D., Candidate of Technical Sciences; Mogilevskiy, E.I., Candi-
    date of Physical and Mathematical Sciences (Deputy Resp. Ed.);
    Mustel', E.R., Corresponding Member, USSR Academy of Sciences; Ed.
    of Publishing House: Yegorova, N.B.; Tech. Ed.: Kashina, P.S.

 PURPOSE: This book is intended for amateur and professional astro-
    nomers interested in eclipse phenomena.

COVERAGE: The present compendium is the fourth in a series published
    by the Academy of Sciences of the USSR on solar eclipses observed
    in the Soviet Union. The present collection reports on the results
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Total Eclipse (Cont.)   SOV/1391

of observations obtained by scientific teams of 20 research in-
stitutions during the total solar eclipses of 1952 and 1954. The
reports include studies of the sun's chromosphere, its total cor-
onal brightness, monochromatic glow, structure, polarization pho-
tometry, and colorimetry. The results of studies on coronal
radio emissions for various wavelengths and on the effect of the
sun on the earth's atmosphere, based on the February 1952 and June
1954 eclipses, are presented. The individual articles are accom-
panied by tables, diagrams and bibliographic references.

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Fomenko, B.D.   Variations in the Coefficient of Atmospheric Trans-
    parency During the Total Solar Eclipse of June 30, 1954   307

Gavrilov, I.V. and I.G. Kolchinskiy.   Computing Corrections
    of the Moon's Coordinates From Observations of the Eclipse
    of June 20, 1954 at the Main Astronomic Observatory of AS
    UkrSSR. .   324

Vitkevich, V.V. and B.M. Chikhachev.   Observation of Solar
    Radio Emissions in the Meter Wave Band During the Total Solar
    Eclipse of February 25, 1952   329

Troitskiy, V.S., M.P. Zelinskaya, V.L. Rakhlin, V.T. Bobrik.
    Results of Observation of Solar Radio Emissions in the 3.2
    and 10 cm Wavelength During the Total Solar Eclipse of
    February 25, 1952 and June 30, 1954   330

Molchanov, A.P., E.M. Gyunninen, A.V. Mel'nikov, Al.P. Molchanov,
    L.L. Myasnikov, V.N. Rysakov, F.I. Skripov, M.M. Filippov. .
    Results of Solar Eclipse Observations of 1952 and 1954 in the
    3.2 cm Wavelength   331
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Molchanov, A.P. .Distribution of Radio Intensity on the Sun's
    Disk From Observations of Total Solar Eclipses in the 3.2 cm
    Wavelength ·   333

Boyenkova, N.M. Effect of Solar Eclipse on the Ionosphere From
    the February 25, 1952 and June 30, 1954 Observations   336

Grishkevich, L.V., N.A. Mityakov, G.G. Nikiforova. Ionospheric
    .Observations at Gorkiy During the Solar Eclipse of June 30,
    1954   347

Zhestyannikov, L.A. and M.M. Kobrin. F2 Ionospheric Layer
    During the Solar Eclipse of February 25, 1952 in Gorkiy   351

AVAILABLE: Library of Congress

                                        MM/sfm
                                        4-9-59

Card 8/8

KRAT, V.A.; SOBOLEV, V.M.

Physical conditions in weak chromospheric flares. Izv.GAO
no.3:2-10 '58.   (MIRA 13:4)
                (Sun--Prominences)

KRAT, V.A.

Use of the photographic method in the spectrography of the sun.
Zhur. nauch i prikl. fot. i kin. 3 no.1:68-72 Ja-F '58.
(MIRA 11:2)

(Photography--Scientific applications)
(Spectrum, Solar)

80402

3. 1540

SOV/169-59-4-4040

Translation from: Referativnyy zhurnal, Geofizika, 1959, Nr 4, p 123 (USSR)

AUTHORS: Krat, V.A., Pravdyuk, L.M.

TITLE: Hot Zones of Helium Excitation in the Solar Photosphere

PERIODICAL: Izv. Gl. astron. observ. v Pulkove, 1958, Vol 20, Nr 6, pp 55-60
             (Engl. Res.)

ABSTRACT: By observing the D_3 line in the absorption on the solar disk, it
             was established that excitation zones ("helium"zones) are present
             in the solar photosphere. The temperature can amount to
             70,000°C in these zones. A weak D_3 line with an equivalent
             width (ω) of about 6 mÅ may be observed in the absorption
             spectrum throughout the solar disk. Basically, this line
             originates in the chromosphere and not in the photosphere. For
             confirming the latter, two arguments are adduced: 1) the absence

Card 1/2   of considerable radial velocities in the "helium" zones, and

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Hot Zones of Helium Excitation in the Solar Photosphere

2) the high electron concentration (n_e) amounting to 10^{15}. The "helium" zones can coexist in temporary equilibrium with the surrounding unexcited photosphere only provided that a magnetic field of an intensity of $H > 100$ gauss exists.

Authors' résumé

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KRAT, V.A.; SOBOLEV, V.M.

     Excitation of helium in the solar chromosphere. Izv.GAO 20
     no.5:68-73 '58.   (MIRA 13:5)
           (Sun)

KRAT, V.A.; KRAT, T.V.; PRAVDYUK, L.M.

Tho K, H, and Hε lines in the spectrum of the solar chromosphere

Izv.GAO 20 no.5:1-11 '58.   (MIRA 13:5)
                (Spectrum, Solar)

SOV/35-59-10-8079

Translation from: Referativnyy zhurnal. Astronomiya i Geodeziya, 1959, Nr 10, pp 63-64
(USSR)

AUTHORS: Krat, V.A., Sobolev, V.M.

TITLE: On the Physical Conditions in Weak Chromospheric Flares

PERIODICAL: Izv. Gl. astron. observ. v Pulkove, 1958, Vol 21, Nr 3, pp 2-10 (résumé Engl.)

ABSTRACT: The spectra of six weak (force 1) chromospheric flares obtained in the 1st
             order of the diffraction grid of the horizontal solar telescope of the Main
             Astronomical Observatory AS USSR in Pulkovo, were studied photometrically.
             Profiles of emission lines H, K, H_ε, H_8, H_9 and He 3889 were determined;
             the profile of the last line was determined from the asymmetry in the wings
             of the H_8 line; half-widths and equivalent widths of the lines were found.
             Lines H and K were found to be strongly distorted by self-absorption. There-
             fore, the method in which the effect of self-absorption is used was utilized
             to find the number of Ca II ions. It was found that the number of Ca III
             ions $(2 \cdot 10^7)$ exceeded by an order of magnitude the number of Ca II ions.
             During calculations, the electronic temperature was taken to be equal to
Card 1/2 $10,000^\circ K$ and the temperature of the excitation radiation to be $5,000^\circ K$,

On the Physical Conditions in Weak Chromospheric Flares   SOV/35-59-10-8079

$n_e = 10^{11}$. According to the known ratio of the concentration of calcium and hydrogen atoms, it was found that the concentration of hydrogen must equal 10^{13} per cm^3. In lines of the Balmer series, under certain assumptions, the concentration of hydrogen was likewise estimated to equal 10^{13} per cm^3. It was found that in chromospheric flares, hydrogen and calcium glow in the same filaments, while the helium line λ 3889 is formed in hotter "helium" flare filaments with $T_e \approx 25,000°K$, i.e. with the electronic temperature obtained earlier by the authors for the helium filaments of the chromosphere on the whole. The authors consider that the flares of force 1 arise in the same way as "whis-kers", that is, continuously, and that solar service stations miss a large part of such flares. Bibl. 8 titles.

E.Ye. Dubov

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501/4367

PHASE I BOOK EXPLOITATION

Sbornik statey po issledovaniyu mertsaniya zvezd, Moscow, 1958

Trudy Soveshchaniya po issledovaniyu mertsaniya zvezd, Moskva, 19-20 June 1958 g. (Conference on the Study of Star Scintillation) Moscow, Izd-vo AN SSSR, 1959. Errata slip inserted. 1,000 copies printed.

PURPOSE: This book is intended for astronomers. It may be of interest to physicists studying the atmosphere and designers of astronomical equipment.

COVERAGE: The book reports on the Transactions of the Conference on the Study of Stellar Scintillation, held in Moscow from 19 to 20 June 1958. The Conference was organized by the Astronomical Council AS USSR and the Institute of Physics of the Atmosphere AS USSR. The book contains summaries of 23 reports read at the Conference, treating stellar scintillation and flickering of star images. Individual reports deal with methods and instruments of observation. Included are brief summaries of the discussion which followed each meeting, and the resolution adopted by the Conference. References follow individual articles.

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296200

AUTHOR: Krat, V.A.

TITLE: On disturbances of stationary distribution of helium and hydrogen
            atoms in states

PERIODICAL: Referativnyy zhurnal, Astronomiya i Geodeziya, no. 7, 1961, 45, ab-
            stract 7A348 ("Solnechnyye dannyye", 1960, no. 2, 95 - 11)

TEXT: The author considers relaxation time for stationary distribution of
atoms in energy states. The new distribution is established during the time in-
terval equal to $\sim 1/A_{ki}$ after an instantaneous disturbance. Moreover, it essen-
tially depends on ionization equilibrium which is mainly determined by T_e and
depends to a lesser degree on n_e. Strongest disturbances of ionization equili-
brium occur at changes of T_e. At heating up to $T_e = 40,000°K$, the time during
which concentration of ionized helium is doubled is of the order of a few seconds,
if $n_e = 10^{11}$, and of the order of a few minutes, if $n_e = 10^{9}$. The time of es-
tablishing ionization equilibrium for hydrogen turns out to be $\sim 10^{4}$ sec.

[Abstracter's note: Complete translation]   E. Kononovich

Card 1/1

KRAT, V.A.; SULTANOV, F.; SORIN, S.I.

Work of the expedition for the investigation of the astro-climate of Azerbaijan and selection of a site for construction of the Shemakha Astrophysical Observatory. Izv. AN Azerb. SSR Ser. fiz.-mat. i tekh. nauk no.3:151-160 '60.

(Shemakha--Astronomical observatories)   (MIRA 13:11)

89066

S/555/60/007/000/004/007
B123/B201

3,1550 (1057, 1062, 1129)

AUTHOR: Krat, V. A.

TITLE: Evolution of terrestrial planets

PERIODICAL: Voprosy kosmogonii, v. 7, 1960, 66-68

TEXT: This is a brief report on the author's hypothesis concerning the evolution of the Sun and the planets. If one assumes that the Sun, in her primitive state, must have had a much greater mass than she has today, and that it has lost about 80% of her original mass, an explanation can then be provided as to why the planets were divided into two groups (see a previous ⋮ paper by the author in Izv. GAO, No. 156, 1956, and L. E. Gurevich and A. I. Lebedinskiy, Izv. AN SSSR, ser. fiz. Vol. 14, No. 6, 1950). In accordance with the cosmogonic theory of all authors, the gas-dust nebula revolving about the Sun is considered to have been chemically inhomogeneous. It is also assumed that a great part of matter was distributed in this zone, out of which the terrestrial planets were formed. Had 10-20% of the total planetary mass been fine dust, there would have been no solar radiation at a few km already. The author believes that the two groups of planets must have

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Evolution of terrestrial planets

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been formed at different epochs. According to his data and such offered by V. A. Ambartsumyan and B. A. Vorontsov-Vel'yaminov, the time during which the Sun came under the spectral class B, Be, or was a red supergiant, was not more than 10^7 years. The large planets cannot have formed out of the nebula in any shorter time. The concentration of dust throughout the entire formation epoch was high due to concomitant destructive processes. It is easily seen that the inner parts of the nebula about the Sun had to undergo a complete evaporation, and that planets could not possibly form there. If the evaporation temperature of the dust is taken to be 1600°K, the width of the formation zone of Jupiter will have been 2.5 AU. At that time, the Sun was 5.1 times heavier and 670 times brighter than she is today. Her mass was reduced both due to radiation and the formation of comet-like lumps and dust clouds. Hydrogen was already fully removed from the innermost part of the ring, out of which Mercury and Venus were formed. No more planet could form in a zone nearer than that of Mercury. The evolution of terrestrial planets was apparently completed, once the evolution of the Sun into an ordinary star was ended. At that time, the solar mass was still 1.5 times the present one. It is possible that the radioactive matter of terrestrial planets may have been formed at the same time as that part of matter which

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Evolution of terrestrial planets

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was ejected from the Sun. There are 4 Soviet-bloc references.

ASSOCIATION: Glavnaya astronomicheskaya observatoriya AN SSSR (Main Astro-nomical Observatory AS USSR)

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3.9000 (*1041, 1109, 1327*)

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S/555/60/007/000/005/007
B123/B201

AUTHOR: Krat, V. A.

TITLE: Evolution of the Earth

PERIODICAL: Voprosy kosmogonii, v. 7, 1960, 97-120

TEXT: This report is based upon 36 references. The problem of the evolution of the planets of the solar system concerns astronomers and geologists alike. Furthermore, it is a ground of dispute between those who hold that the Earth began in the hot state and those who claim a cold state at its origin. Either conception tries to find a confirmation in geological conditions. The first chapter of the present paper is devoted to the formation and the evolution of the Earth's crust in pre-geological times. V. V. Belousov stated that the Earth's crust must have formed in the Pre-cambrian within $2 \cdot 10^9$ years. According to V. I. Baranov, this process took $4.5 \cdot 10^9$ years. A study made by A. V. Khabakov is of special interest in this connection, insofar as he found an analogy to the Precambrian in the first period of evolution of the Moon's surface. In his opinion, a weakening of the tectonic activity is in general characteristic of terrestrial

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Evolution of the Earth

planets and constitutes a basic tendency in the evolution of the solid
surface of the planets. V. I. Lodochnikov held the same opinion as
W. H. Ramsey concerning the chemical composition of the planets. A. P.
Vinogradov and S. D. Chetverikov believe that chemical differentiation was
possible in the state of fusion only. The second chapter in devoted to
the development of the composition of the Earth's atmosphere. It is shown
that, in contrast with Fesenkov's hypothesis, neither the Earth nor the
Moon can ever have had extended atmospheres, which chiefly consisted of
hydrogen and other light gases. The primary atmosphere of the Earth
probably consisted of nitrogen, oxygen, steam and slight rare gas admix-
tures. The third chapter deals with the evolution of the Earth. The
author's hypothesis of accretion is discussed. L. E. Gurevich, A. I.
Lebedinskiy, and O. Yu. Shmidt hold the opinion that the chemical differ-
entiation of matter in the protoplanetary cloud may have been caused by
solar radiation. P. N. Chirvinskiy and B. Yu. Levin are also mentioned.
According to V. S. Safronov, the process of accretion took 10^8 years.
Chapter 4 is devoted to the energy source and the gravitational and geo-
chemical differentiations of matter. It is shown that the gravitational
differentiation of matter, together with the energy of radioactivity, is

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sufficient to form a liquid core with a temperature of $T \approx 5000\text{-}7000°$ and local temporary magmatism in the solid body of the Earth. Ye. A. Lyubimova has made calculations on the temperature of the Earth's interior. Calculations on the energy liberated during the formation of the Earth have been made by Ye. N. Lyustikh, V. A. Magnitskiy explains the gravitational differentiation of matter by geochemical reactions. The concentration of earthquakes in the upper strata at present can be regarded as the result of a gravitational differentiation coming to an end in the near future. There are 1 table and 36 references: 25 Soviet-bloc and 11 non-Soviet-bloc.

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S/035/61/000/011/014/028
A001/A101

AUTHORS: Krat, V.A., Yudina, I.V.

TITLE: Photoelectrical photometry of photospheric granules

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 11, 1961, 57,
abstract 11A414 ("Solnechnyye dannyye", 1960 (1961), no. 9, 63-65)

TEXT: The authors describe the results of granule observations by means
of the Pulkovo horizontal telescope. The Sun's image shifted, due to diurnal
motion, over the membrane of 0.04 mm in diameter (scale was 3".2 in 1 mm). Photo-
metric contours were obtained even for smallest granules, 0".4 in diameter. Re-
cording was made with a ФЭУ-25 (FEU-25) photomultiplier and a d-c amplifier on
a МПО-2 (MPO-2) loop oscillograph. Fluctuations in the brightness of the inter-
granular background were discovered by measurements. The "granule-background"
brightness difference is equal to 2.1% for granules with half-width 0.42-0".56;
2.6% for granules with half-width 0.70-1".68, and 5.1% for granule groups with
dimensions 2.8-5".6. Large fluctuations with an average difference of 8.7% were
noted in regions of 30-110" dimensions. There are 8 references.
[Abstracter's note: Complete translation]   V, Kurt.
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23710

S/035/61/000/004/043/058
A001/A101

3, 1540

AUTHOR: Krat, V. A.

TITLE: On appearance of emission helium lines in spectrum of chromospheric flares on the Sun's disk

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 4, 1961, 62, abstract 4A475 ("Solnechnyye dannyye", 1959/1960, no. 9, 76-79)

TEXT: Calculations led the author to the conclusion that for optically thin formations intrinsic emission in helium lines should be small in comparison with scattering; nevertheless he holds that in case of $\tau > 5$, emission profile should be observed on the background of a wide absorption line. He presents estimates of n_e and T_e made for the case of appearance of emission of a flare in D_3. It turned out that if, at the Doppler width of emission profile $\Delta\lambda_D = 0.3A$, its central intensity is equal to intensity of continuous spectrum, the best agreement of the theory with observations will take place at $n_e = 10$, $T_e = 30,000^\circ$ K and population $n_{2p} = 3 \times 10^4$. At the disk edge the flare is visible due to scattering of photospheric radiation from free electrons. In order to become

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S/035/61/000/004/043/058
A001/A101

On appearance of emission ...

visible, it should be 1,000 times brighter in white light than near coronal formations. There are 5 references.

E. Dubov

[Abstracter's note: Complete translation]

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3,1540

S/C55/61/000/007/019/021
A001/A101

AUTHOR: Krat, V.A.

TITLE: Brightness fluctuation on the solar disk and brightness of granules

PERIODICAL: Referativnyy zhurnal, Astronomiya i Geodeziya, no. 7, 1961, 46, ab-
stract 7A350 ("Solnechnyye dannyye", 1960 (1961), no. 10, 69 - 70)

TEXT: The photometric cross section characterizes brightness fluctuations
on the disk rather than central brightnesses of granules; these fluctuations are
identified with drops of mean brightness of granules and mean brightness of inter-
granular background. The brightness distribution in granules is such that their
mean brightness turns out to be close to the central brightness. The mean value
of correction amounts to $\sim 0.5\%$. The author points out that all the values of
mean brightnesses cited by him earlier must be increased by 0.5%.

V. Yesipov

[Abstracter's note: Complete translation]

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22300

3,15 40

S/035/61/000/005/019/042
A001/A101

AUTHORS: Krat, V.A., Sobolev, V.M.

TITLE: Excitation of helium in the chromosphere and chromospheric flares

PERIODICAL: Referativnyy zhurnal. Astronomiya i Geodeziya, no. 5, 1961, 53, abstract 5A351 ("Izv. Gl. astron. observ. v Pulkove", 1960, v. 21, no. 4, 2 - 16, Engl. summary)

TEXT: The authors calculated the time of establishing the stationary distribution of helium atoms by states. In flares it should amount to ~ 1 sec, in chromospheric filaments to ~ 1 min. Stationarity equations for the levels 2^3S, 2^3P, 3^3P, 3^3D, 4^3D and 4^3S of He I are derived and solved, as well as the equation of ionization equilibrium in which is taken into account only ionization by electronic impact from levels 1^1S, 2^3S, 2^1S and photoionization from levels 2^3S and 2^1S. Only main terms are used in the equations, since the rigorous solution of the problem has no sense in view of the lack of certainty in the numerical values of effective cross sections of ionization and excitation by electronic impact. Numerical values of ratios n_+/n_1 and n_k/n_1 (where k is the number of the corresponding level) and intensities of emission lines $\lambda\lambda 10,830$, 3889, 5875 and

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22386

Excitation of helium in the chromosphere ...

4713, calculated in ergs per 1 atom in the ground state, are obtained for a series of temperatures from 10,000 to 150,000°K and electronic densities from 10^{10} to 10^{15} cm^{-3}. For the same values of n_e and T_e a table is compiled which gives the ratios of intensities of lines $\lambda\lambda$10,830, 3889, 4471 and 4713 to the intensity of the D$_3$ line. At $n_e \leqslant 10^{12}$cm^{-3} and $10,000° \leqslant T_e \leqslant 150,000°$K the ratios of intensities of helium lines prove to be constant, which agrees well with observational data for the undisturbed chromosphere. For helium filaments the most probable values of temperature and electronic density are $T_e = 25,000°$K and $n_e = 10^{10}$ cm^{-3}. However, for the flare on June 24, 1956, the value of $n_e > 10^{14}$ cm^{-3}, was obtained. The arising of D$_3$ in emission on the disk can not be explained by any T_e and n_e in the optically thin layer. Apparently some other mechanisms of excitation should be considered in this case. The problem is discussed on the conditions of appearance of line λ4686 of He II. Stationarity equations are solved for levels 4F and 3D of He II, as well as the equation of ionization equilibrium with allowance for ionization by electronic impact from the ground level only. Photoionization by hard radiation is not taken into account, because the gas must be opaque at con-siderable ionization of helium in Lyman continuum of He II (which is overlapped also by the Lyman continuum of hydrogen and ground continuum of He I). Calcula-

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